



# ***DARPA*Tech**

## ***2002 Symposium***

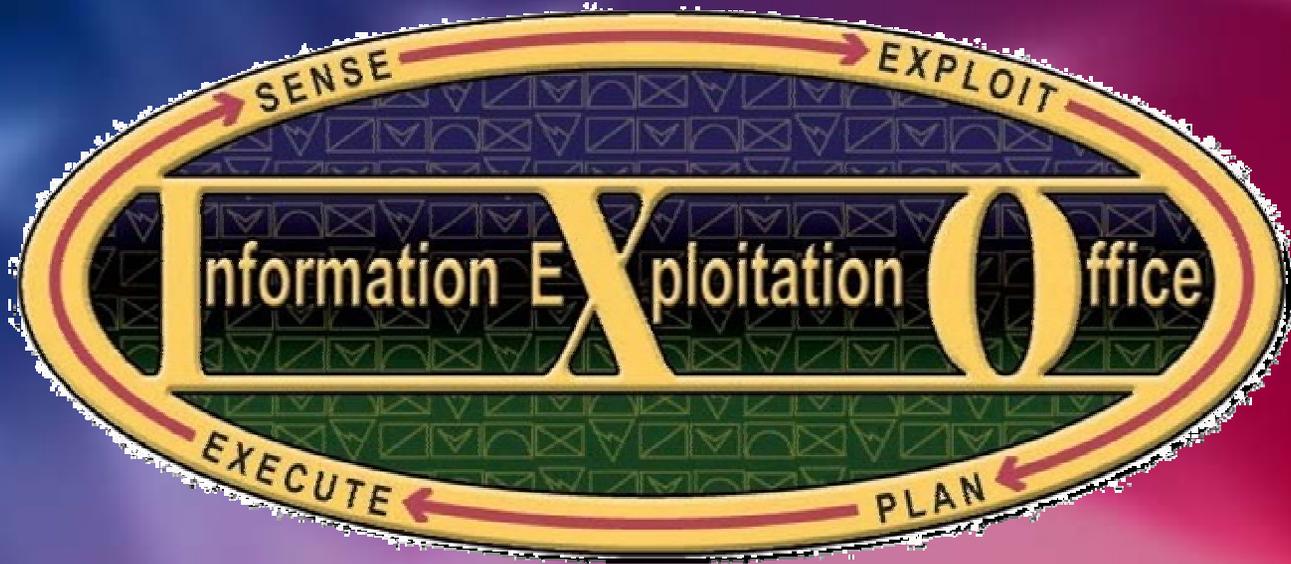
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***Fantasy***



**Richard P. Wishner**

Director,  
Information  
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# Context For Future Warfare

- ▶ U.S. will face new, challenging opponents
- ▶ Rapid, dominant, decisive operations
- ▶ Fight with or without reliance on coalition or indigenous forces



# Goal: Precisely attack and kill any ground target, anywhere, any time

- ▶ High confidence target identification
- ▶ Minimal inadvertent collateral damage
- ▶ Minimal undesired casualties



# C4KISR

## C4ISR + Kill = C4KISR

- ▶ Find, track and precisely identify targets
- ▶ Dynamically command and control weapons and sensors
- ▶ Share information



# Diverse Targets



## FBI TEN MOST WANTED FUGITIVE

MURDER OF U.S. NATIONALS OUTSIDE THE UNITED STATES;  
CONSPIRACY TO MURDER U.S. NATIONALS OUTSIDE THE  
UNITED STATES; ATTACK ON A FEDERAL FACILITY RESULTING IN DEATH

**USAMA BIN LADEN**



Date of Photograph Unknown

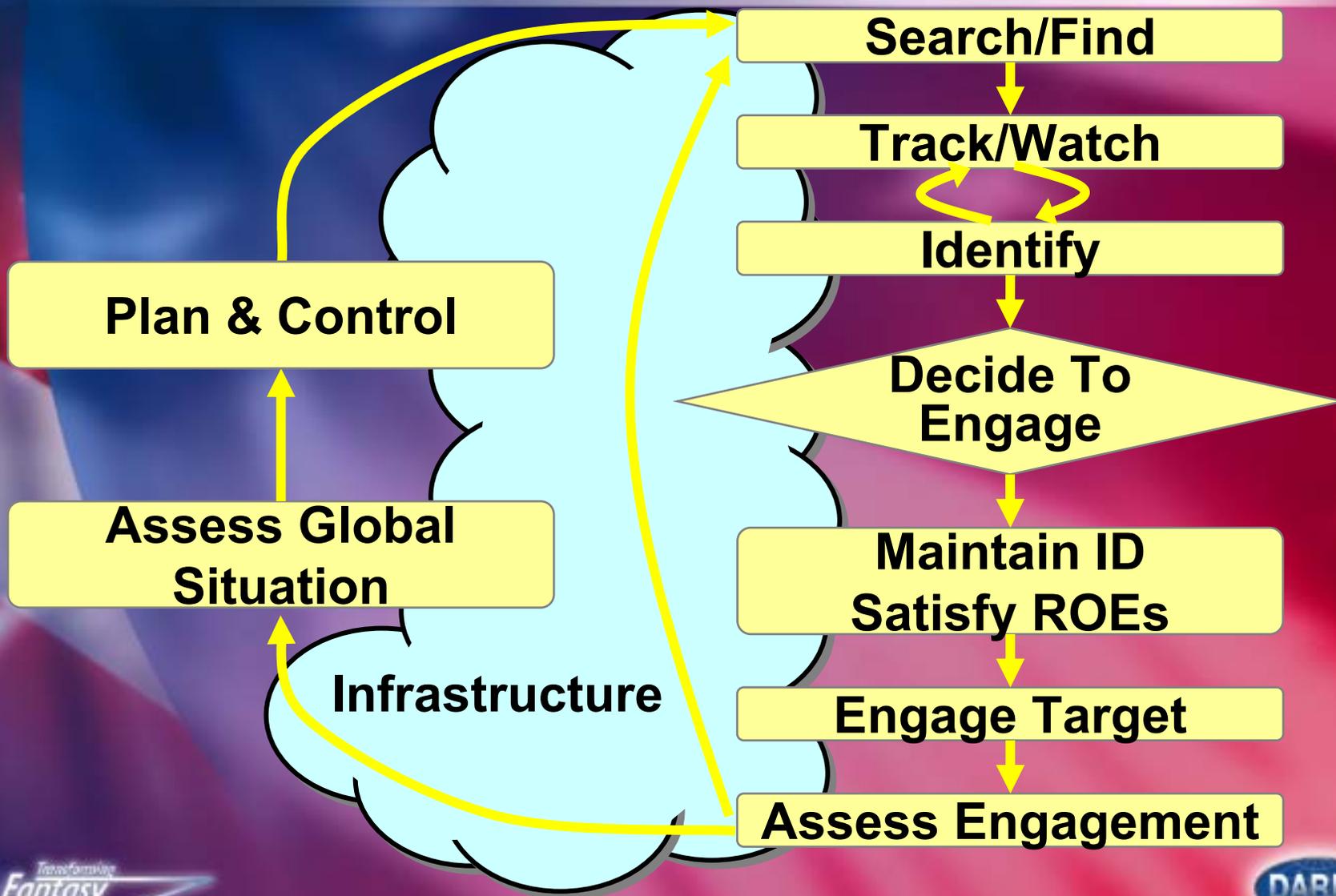
Aliases: Usama Bin Muhammad Bin Ladin, Shaykh Usama Bin Ladin, the Prince, the Emir, Abu Abdallah, Mujahid Shaykh, Hajj, the Director

Source: <http://www.fbi.gov/mostwanted/topten/fugitives/laden.htm>

# Need diverse technologies



# C4KISR Model



# Search/Find

## ▶ Desired Capabilities

- Any target, moving/stationary, any terrain
- Immediate exploitation with minimal HITL

## ▶ Potential Solutions

- Multi-mode, change detection radar
- Hovering GMTI radar (low MDV) for dismounts and small slow vehicles
- Rapid multi-platform emitter location



# Track/Watch

## ▶ Desired Capabilities

- Continuous automatic tracking
- Low probability of false association

## ▶ Potential Solutions:

- Ubiquitous multi-phenomenological multi-platform networked sensing
- Adaptive multiple hypothesis feature/model aided network centric tracking



# Identification

## ▶ Desired Capabilities

- Automated high-confidence combat ID
- Rapidly adapt to new/modified targets

## ▶ Potential Solutions

- Sensors and exploitation with higher dimensionality, multiple-phenomena and diverse viewing geometry
- Model-based target recognition based on generic target components



# Decide to Engage

## ▶ Desired Capabilities

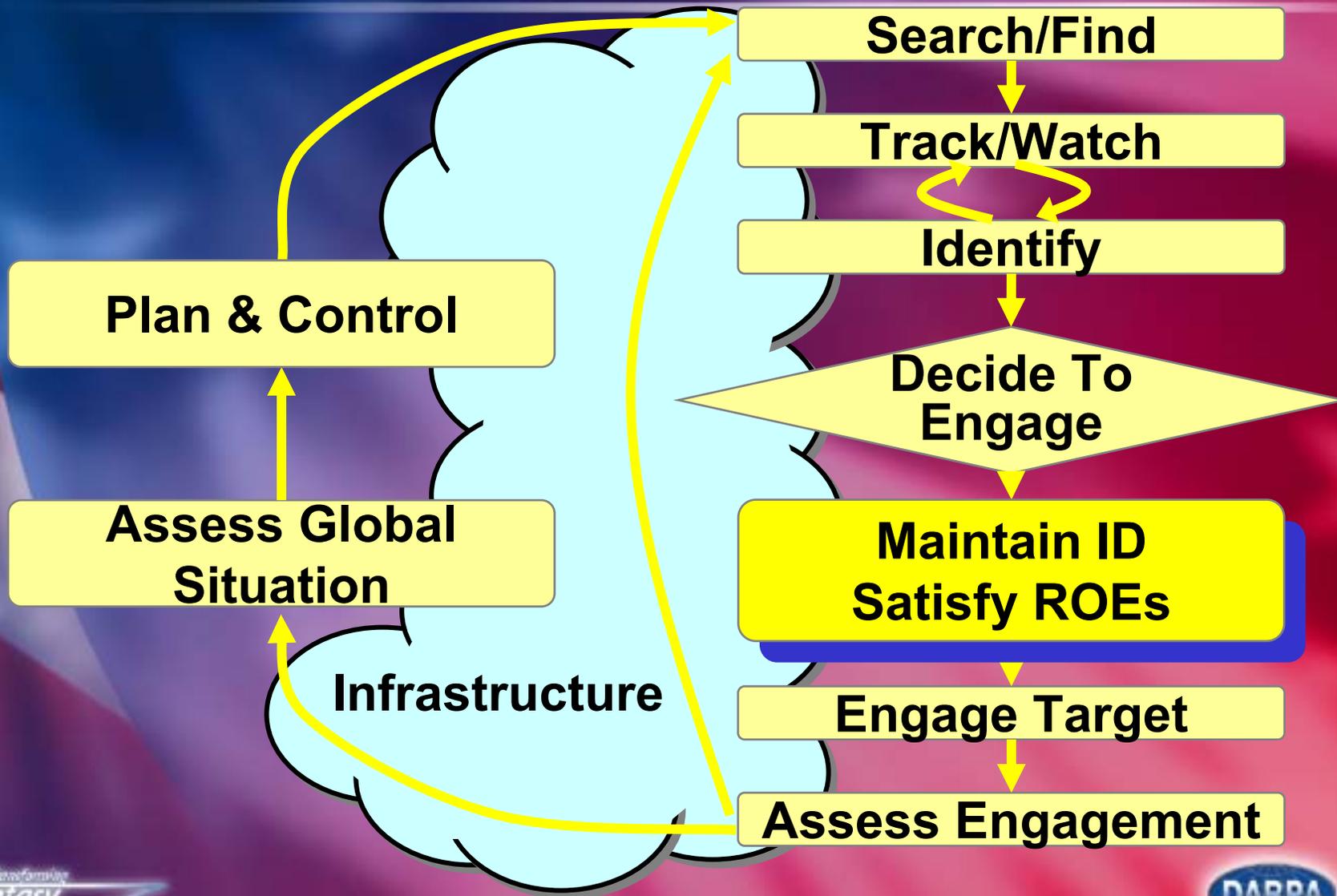
- Automated assessment of ROE compliance
- Effective pairing of weapons to targets

## ▶ Potential Solutions

- Sensors and ATR with PID of 99.99%
- Target pairing that is: effects-based, collateral damage aware, and rapid



# C4KISR Model



# Maintain ID/Satisfy ROEs

## ▶ Desired Capabilities

- Automatic maintenance of target ID
- Automatic “safe-to-fire” checks

## ▶ Potential Solutions

- Continuous tracking: multi-platform, multi-sensor/mode, multi environment
- Close-in sensing/ATR to re-ID and recognize potential collateral damage



# Engage Targets

## ▶ Desired Capabilities

- Continuous off-board control of weapon aim point
- All-weather, all target seekers

## ▶ Potential Solutions

- Low cost COTS components for weapon datalinks
- Multi-mode, programmable seekers



# Assess Engagements

## ▶ Desired Capabilities:

- Measure significant physical damage or cessation of undesired activity

## ▶ Potential Solutions:

- Change detection and interpretation based on 3D shape or signature
- Detection of changes in behavior inferred from all sources of data





# Assess Global Situation

## ▶ Desired Capabilities

- Infer opponent's capabilities and range of possible intent

## ▶ Potential Solutions:

- Courses of action and workarounds
- Model based inference of functional structures from physical capabilities
- Leading to effects-based target nomination



# Plan and Control

## ▶ Desired Capabilities

- Synchronized routing and scheduling of multi-role platforms
- Continuous plan generation, assessment and refinement
- Unified air and ground operations

## ▶ Potential Solutions:

- Real-time capture of plans and events
- Collaborative synthesis of multi-mission plans from “playbooks”



# Network-Centric Infrastructure

## ▶ Desired Capabilities:

- Active management of information flows
- Agile, reconfigurable information systems

## ▶ Potential Solutions:

- Mobile, ad hoc, high capacity wireless communications
- Real-time allocation of applications to processors
- Automatic construction of semantic translators

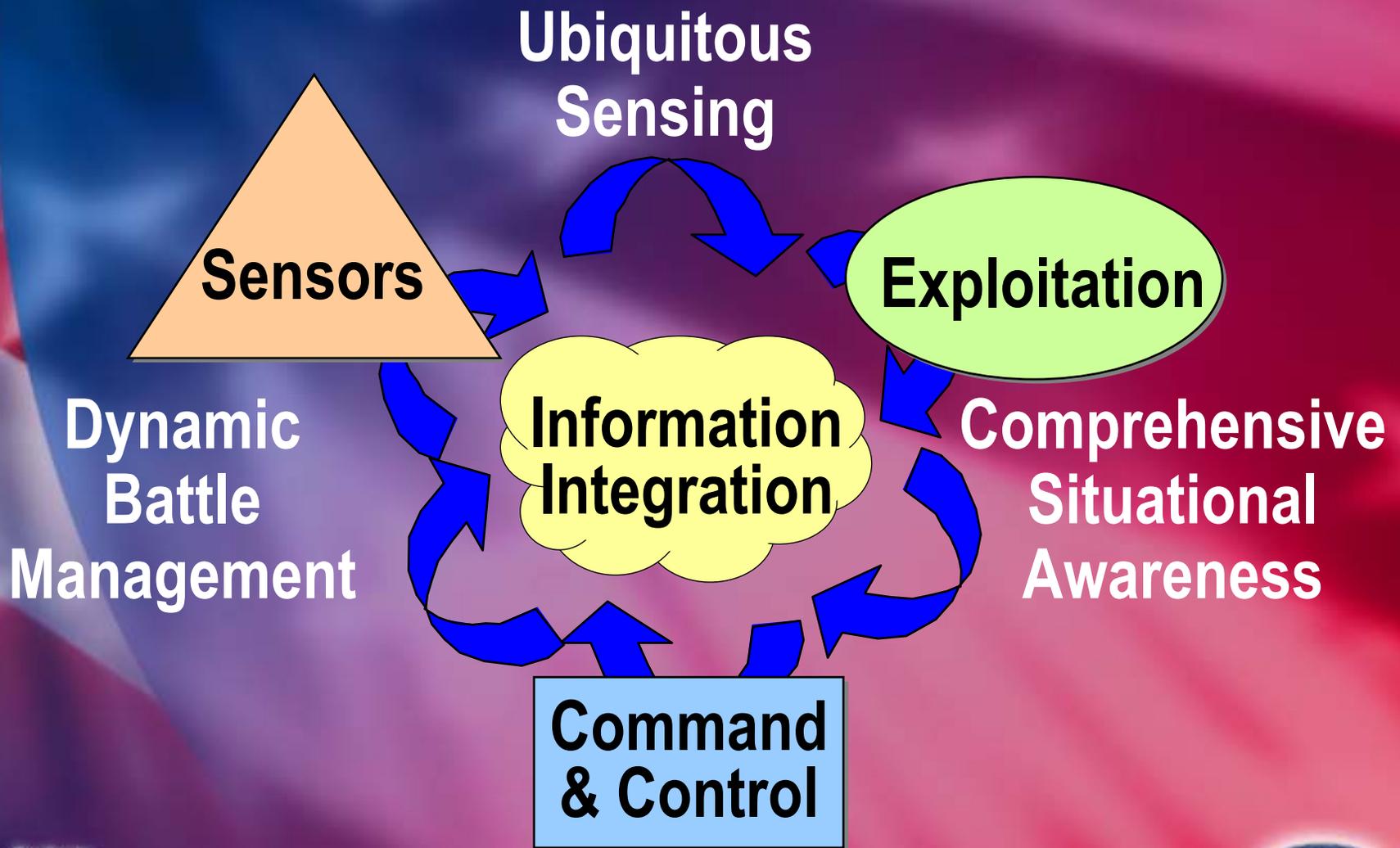


# Future Projects

- ▶ Wide area surveillance
- ▶ Foliage penetration MTI
- ▶ High-dimensionality sensing
- ▶ Detection and tracking of dismounts
- ▶ Automatic target recognition
- ▶ Continuous target tracking
- ▶ Battlespace prediction
- ▶ Dynamic synchronization of assets
- ▶ Network-centric enabling technology



# Information Exploitation





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